Crop Ecology and
Genetic Resources Unit

Plant Production and
Protection Division

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PLANT INTRODUCTION NEWSLETTER

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Contributions in the form of reviews, news or original papers within the publishing field of the Plant Introduction Newsletter are invited in any of the three official languages of the Food and Agriculture Organization - English, French or Spanish. Articles are printed in the language in which they are received. Certain matter will be printed in all three languages.

C O N T E N T S

EDITORIAL

Editorials are not always written by editors. In this respect the editorial which introduces the present issue, making use as it does of material provided by H.V. Harlan and J.R. Harlan, is not unusual. Editorials must have contemporary relevance, and it is certainly relevant today - some have said that it is even becoming fashionable - to speak of the dangers of replacing native races of cultivated plants by new, uniform cultivars. It is unusual, however, that the words which we print below are those of a great barley breeder of more than a generation ago.

In 1936 H.V. Harlan made the following eloquent plea for the conservation of our heritage of genetic resources:

"In the great Laboratory of Asia, Europe and Africa, unguided barley breeding has been going on for thousands of years. Types without number have arisen over an enormous area. The better ones have survived. Many of the surviving types are old. Spikes of grain from Egyptian ruins can often be matched with ones still growing in the basins along the Nile. The Egypt of the Pyramids, however, is probably recent in the history of barley. In the hinterland of Asia there were probably barley fields when man was young. The progenies of these fields with all their surviving variations constitute the world's priceless reservoir of germ plasm. It has waited through long centuries. Unfortunately, from the breeder's standpoint, it is now being imperilled. When new barleys replace those grown by the farmers of Ethiopia or Tibet, the world will have lost something irreplaceable."

In the third of a century since this warning was first given there have been great changes in the world. In some respects changes have followed a foreseeable pattern, but few, if any of us, would have predicted the devastating impact on world genetic resources of new varieties made widely adapted (adaptable??) by day-length insensitivity. The sweep of the Mexican wheat has been spectacular. Probably no agronomist fully realised the ecological and geographical limitations imposed by photoperiodic requirements. Release from these limitations can make a superior variety superior over a tremendous range of conditions.

But this very success of modern plant breeding threatens plant breeding programmes of the future. The threat is that foreseen more than thirty years ago by H.V. Harlan. It would be most irresponsible if Mexican wheat or other improved varieties were allowed to replace native wheats in Turkey, Iran, Afghanistan, West Pakistan, Ethiopia or other countries, or if new rice varieties were allowed to replace the resources of the species native to India, East Pakistan, southeast Asia and Oceania, and the continent of Africa, without an all-out effort to collect and preserve these stocks for future breeding. Success always carries with it a degree of responsibility, and phenomenal success implies a heavy burden of responsibility.

Future generations would have a right to be unforgiving if we fail to rise to the emergency in time and permit our rich heritage of genetic resources in the plants we cultivate to slip away uncollected and unpreserved.

In the end, history judges men by what they do rather than by what they say, and though there is a growing awareness of the dangers of genetic erosion and of the need to prevent it, the problem becomes essentially a problem of action - action based upon a precisely defined programme. But to define the programme is difficult when so much is still relatively unknown -how must collections be maintained? -how can surveys be made? -how ought collections to be made? -how can collections best be utilized? -how can genetic variation be conserved? Successful action depends on experience, and experience is still largely lacking.

We therefore invite readers' comments and advice. In doing so we remind them that, at the present stage of our knowledge, all experience is of value. There are too many modest men who believe that, because their collections are small, and of a single species, these must be of little value. Yet this is far from the truth; in some cases they hold more samples than major institutes. And as with samples, so it is with experience.

E D I T O R I A L   E N Q U I R I E S   T O

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- O T H E R   E N Q U I R I E S   T O -

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FAO AFGHANISTAN WHEAT COLLECTION

by

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During the period June to October 1968, a FAO exploration team from the Plant Production and Protection Division visited Iran and Afghanistan with four objectives:

1. to survey the geographical and ecological distribution of the primitive wheat races of the region,
2. to make collections of these and of some other crops,
3. to assess the extent of genetic erosion in wheat since the survey of Kuckuck in Iran in the 1950s and of Vavilov and Bukinich in Afghanistan in the 1920s, and
4. to discuss the possibility of establishing a gene bank in either of these countries.

As is known, Afghanistan is one of the centres of genetic diversity of common and club wheats, *Triticum aestivum* and *T. aestivum compactum*. Vavilov and Bukinich (1929) concluded, on the basis of extensive studies from 1924 to 1927, that the country was a tremendous potential source of variation in both wheats. Iran lies between the centres of diversity of durum and common bread wheats, and many species of *Triticum* have evolved there. Kuckuck (1956) also recorded a small area in the neighbourhood of Shahr Kurd in which *T. spelta* was still cultivated, but the present expedition found no trace of this species which, it was said in the villages, being difficult to thresh had become unpopular, in spite of its adaptation to the severe conditions of mountainous Bakhtiari. However, *Triticum dicoccum*, equally difficult to thresh, was still to be found in the same area.

This article presents some preliminary details of the collections made during the mission. A total of 366 samples were collected, of which 221 were wheat races from habitats varying between 500 and 3,500 meters above sea-level, and from 31°N to 38°N. Winter and spring forms from irrigated and non-irrigated areas were collected from a wide range of fertility and humidity conditions. A real risk of serious genetic erosion exists. In Iran, although collections of native wheats have been made and much used in plant breeding, Mexican wheats are being introduced on a large scale. Even in isolated mountain valleys of Afghanistan Mexican introductions are to be found. All collections have been made according to the sampling techniques described by Bennett (1970), and duplicate samples of the collection were sown at Kabul for multiplication and preliminary observations in the autumn of 1968. Multiplied seed has now been distributed to the Near East Wheat and Barley Improvement Project in Cairo in preparation for trials in all of the member countries of the project.

Samples which were broaght to Rome were sown at Minoprio in the north of Italy in December 1968 where preliminary observations were also made. Seed has also been distributed to the USDA at Beltsville, Maryland, to the Laboratory of Plant Genetics, at Casaccia near Rome, and to other centres.

Seed of genera other than wheat have been distributed to institutes in Czechoslovakia, Sweden, Israel and the USA. Material from these collections is still available in Rome in small quantities for distribution on request. Data relating to the Afghanistan collections are listed in tables 1 and 2.

References

Bennett, E. (1970) Tactics of Plant Exploration. *in* Genetic Resources in Plants: their exploration and conservation. (eds. Frankel, O.H. and Bennett,E.). Blackwell. Oxford.

Kuckuck, H. (1956) Reportto the Government of Iran on distribution and variation of cereals in Iran. FAO Report 517.

Vavilov, N.I. and Bukinich, D. D. (1929) Agricultural Afghanistan. Institute of Applied Botany, Leningrad.

Table 1: LIST OF VARIOUS GENERA OTHER THAN WHEAT COLLECTED IN AFGHANISTAN

FAO Number	Genus	FAO Number	Genus
26.227	Hordeum sp	26.358	Hordeum sp
26.242	Oryza sativa	26.360	" "
26.243	Armeniaca vulgaris	26.363	Avena sp
26.244	Pistacia sp	26.365	Linum usitatissimum
26.245	Amygdalus persica	26.369	Vicia sp
26.246	Trifolium resupinatum	26.373	Hordeum sp
26.247	Amygdalus communis	26.379	Aegilops sp
26.248	Oryza sativa	26.381	Daucus carota
26.249	Cucumis melo	26.382	Solanum melongena
26.250	" "	26.383	Raphanus sativus
26.251	" "	26.384	" "
26.254	Hordeum sp	26.385	Cucumis melo
26.255	" "	26.386	" "
26.258	Secale sp	26.387	" "
26.265	Citrullus vulgaris	26.388	" "
26.268	Secale sp	26.389	" "
26.270	Hordeum sp	26.395	Hordeum sp
26.271	Cucumis melo	26.399	Lathyrus sp
26.283	Amygdalus persica	26.403	Secale sp
26.284	" communis	26.404	Trifolium resupinatum
26.285	Armeniaca vulgaris	26.408	Secale sp
26.288	Secale sp	26.410	Hordeum sp
26.289	Trifolium resupinatum	26.411	Lathyrus sp
26.291	Secale sp	26.418	Aegilops sp
26.293	" "	26.419	" "
26.295	" "	26.422	Hordeum sp
26.298	" "	26.428	Ervum lens
26.300	" "	26.429	Cicer arietinum
26.302	" "	26.436	Cucumis melo
26.304	" "	26.444	Secale sp
26.307	" "	26.449	Pisum sp
26.308	" "	26.453	Trifolium sp
26.312	" "	26.454	" "
26.318	Zea mais	26.458	Secale sp
26.320	Secale sp	26.459	Vicia sp
26.323	Armeniaca vulgaris	26.464	Secale sp
26.323	" "	26.465	Amygdalus communis
26.328	Hordeum sp	26.466	Cucumis melo
26.333	Vicia sp	26.468	Armeniaca vulgaris
26.336	Hordeum sp	26.469	Phaseolus sp
26.337	Amygdalus communis	26.470	Hordeum sp
26.338	" "	26.500	Lathyrus sp
26.339	" "	26.502	Hordeum sp
26.350	" "	26.513	Medicago sativa
26.352	Hordeum sp	26.531	Agropyron sp
26.356	Aegilops sp	26.540	Cucumis melo
26.357	Hordeum sp		

Table 2: DATA RELATING TO AFGHANISTAN WHEAT COLLECTION

FAO Number	Collection Number	Latitude	Longitude	Altitude (meters)	Species	Variety or local name	Winter or Spring	Irrigated or Non-irrigated
26.225	68/034	N 3418	E 06212	950	T. aestivum	White Shanazi	W	Irr.
26.226	68/035	N 3422	E 06205	950	T. aestivum	Black Kalak	W	Irr.
26.228	68/037	N 3400	E 06200	900	T. turgidum	Zafarani	W	Irr.
26.229	68/038	N 3400	E 06200	900	T. aestivum	Safid Koh	W	Irr.
26.230	68/039	N 3400	E 06200	900	T. aestivum		W	
26.231	68/040	N 3400	E 06200	900	T. aestivum	White Kalak	W	Irr.
26.232	68/041	N 3400	E 06200	900	T. aestivum	Black Kalak	W	Irr.
26.233	68/042	N 3400	E 06200	900	T. aestivum	Saficha	W	Irr.
26.234	68/043	N 3452	E 06230	1000	T. aestivum	Shanazi	W	Irr.
26.235	68/044	N 3400	E 06200	900	T. aestivum	Gozareh	W	Irr.
26.236	68/045	N 3400	E 06200	900	T. aestivum	Safid Hosha Khalifara	W	Irr.
26.237	68/046	N 3400	E 06200	900	T. aestivum	Safid Hosha	W	Irr.
26.238	68/047	N 3400	E 06200	900	T. aestivum	Shanazi Safidak	W	Irr.
26.239	68/048	N 3420	E 06200	900	T. turgidum	Mauri	W	Irr.
26.240	68/051	N 3420	E 06203	950	T. turgidum	Zafarani	W	Irr.
26.241	68/052	N 3400	E 06200	900	T. turgidum	Zafarani	W	Irr.

FAO Number	Collection Number	Latitude	Longitude	Altitude (meters)	Species	Variety or local name	Winter or Spring	Irrigated or Non-irrigated
26.252	68/063	N 3342	E 06217	1350	T. aestivum	Shanazi	W	Irr.
26.253	68/064	N 3320	E 06210	1100	T. aestivum	Black Shanazi White Shanazi	W	Irr.
26.256	68/067	N 3308	E 06208	1000	T. aestivum	Kharpara Shanazi	W	Irr.
26.257	68/068	N 3252	E 06215	900	T. aestivum	Safid Hosha	W	Irr.
26.259	68/070	N 3243	E 06215	800	T. aestivum		W	Irr.
26.260	68/071	N 3230	E 06210	750	T. aestivum	Safidak	W	Irr.
26.261	68/072	N 3220	E 06213	750	T. aestivum	Chahansoor	W	Irr.
26.262	68/073	N 3220	E 06213	750	T. aestivum	White Kalak	W	Irr.
26.263	68/074	N 3220	E 06203	750	T. aestivum	Awned White Kalak	W	Irr.
26.264	68/075	N 3220	E 06156	750	T. aestivum	Sirhosha	W	Irr.
26.266	68/077	N 3227	E 06211	800	T. aestivum	Safidak	W	Irr.
26.267	68/078	N 3237	E 06257	1050	T. aestivum) T. turgidum)	(White Kalak (Shanazi	W	Irr.
26.269	68/080	N 3225	E 06220	950	T. aestivum T. turgidum		W	Irr.
26.272	68/083	N 3138	E 06418	900	T. aestivum	White Kandahar	W	Irr.
26.273	68/084	N 3148	E 06442	900	T. compactum	Mahparcha	W	Irr.
26.274	68/085	N 3142	E 06540	1400	T. aestivum	White Kalak	W	Irr.
26.275	68/086	N 3142	E 06540	1400	T. aestivum	Sirhosha	W	Irr.
26.276	68/087	N 3142	E 06542	1400	T. aestivum	Red Kalak	W	Irr.
26.277	68/088	N 3142	E 06540	1400	T. aestivum	White Kalak	W	Irr.

FAO Number	Collection Number	Latitude	Longitude	Altitude (meters)	Species	Variety or local name	Winter or Spring	Irrigated or Non-irrigated
26.278	68/089	N 3138	E 06588	1400	T. aestivum	White Kalak	W	Irr.
26.279	68/090	N 3138	E 06558	1400			W	Irr.
26.280	68/091	N 3138	E 06558	1400	T. aestivum	Chahansoor	W	Irr.
26.281	68/092	N 3138	E 06604	1400	T. aestivum	Yellow Mukuri	W	Irr.
26.282	68/093	N 3346	E 06822	2350	T. aestivum T. compactum	Ghund Hosha	W	Irr.
26.286	68/097	N 3335	E 06825	2200	T. aestivum	Chordi (Kalak), Sardah Sirhosha Safid Hosha	W	Irr.
26.287	68/098	N 3335	E 06825	2200	T. aestivum	Bahri	S	Irr.
26.290	68/101	N 3335	E 06825	2200	T. compactum	Mixed collection of local varieties	W	Irr.
26.292	68/103	N 3333	E 06828	2200	T. aestivum	Sardah Garmah	W	Irr.
26.294	68/105	N 3345	E 06833	2350	T. aestivum	Garmah	W	Irr.
26.296	68/107	N 3336	E 06907	2290	T. aestivum	Saficha Sircha	W	Irr.
26.297	68/108	N 3337	E 06912	2350	T. aestivum	Saficha	W	Irr.
26.299	68/110	N 3339	E 06911	2500	T. aestivum T. compactum	Saficha	W	Irr.
26.301	68/112	N 3343	E 06912	2700	T. aestivum T. compactum		W	Irr.
26.303	68/114	N 3345	E 06907	2350	T. aestivum T. compactum	Sardah	W	Irr.
26.305	68/116	N 3404	E 06845	2050	T. αompactum	Sardah	W	Irr.

FAO Number	Collection Number	Latitude	Longitude	Altitude (meters)	Species	Variety or local name	Winter or Spring	Irrigated or Non-irrigated
26.306	68/117	N 3407	E 06848	2000	T. aestivum T. compactum	Sardah	W	Irr.
26.309	68/120	N 3432	E 06916	2200	T. aestivum		W	Irr.
26.310	68/121	N 3432	E 06918	2200	T. aestivum	Safid Hoshah Sirhosha	W	Irr.
26.311	68/122	N 3507	E 06913	2000	T. aestivum	Ranazaiba (Saficha)	W	Irr.
26.313	68/124	N 3508	E 06914	2050	T. aestivum	Saficha	W	Irr.
26.314	68/125	N 3513	E 06920	2150	T. aestivum	Lalmavi	W	Irr.
26.315	68/126	N 3513	E 06920	2150	T. aestivum	Logar	W	Irr.
26.316	68/127	N 3513	E 06920	2150	T. aestivum	Pakistani	W	Irr.
26.317	68/128	N 3513	E 06920	2150	T. aestivum	Garmah	W	Irr.
26.319	68/130	N 3509	E 06917	2050	T. aestivum	Saficha	W	Irr.
26.321	68/132	N 3500	E 06850	2250	T. aestivum) T. compactum)	(Sircha Kalak (White Landani (Sardah	W	Irr.
26.324	68/135	N 3501	E 06847	2300	T. aestivum	Sardah	W	Irr.
26.325	68/136	N 3458	E 06837	2350	T. aestivum T. compactum	Sardah	W	Irr.
26.326	68/137	N 3455	E 06818	2500	T. aestivum T. compactum	Sardah	W	Irr.
26.327	68/138	N 3455	E 06817		T. aestivum) T. compactum)	(Bughundak (Kalak Hoshah (Sirhoshah (Sardah	W	Irr.
26.329	68/140	N 3454	E 06817	2300	T. aestivum T. compactum		W	Irr.

FAO Number	Collection Number	Latitude	Longitude	Altitude (meters)	Species	Variety or local name	Winter or Spring	Irrigated or Non-irrigated
26.330	68/141	N 3641	E 06704	400	T. aestivum T. turgidum		W	Irr.
26.331	68/142	N 3641	E 06704	400	T. aestivum T. turgidum	Saficha	W	Irr.
26.332	68/143	N 3639	E 06653	450	T. aestivum		W	Irr.
26.334	68/145	N 3641	E 06653	450	T. aestivum T. compactum		W	Irr.
26.335	68/146	N 3647	E 06731	380	T. aestivum	Sircha Saficha	W	Irr.
26.340	68/151	N 3645	E 06658	350	T. turgidum	Mauri	W	Irr.
26.341	68/152	N 3645	E 06658	350	T. aestivum	Saficha	W	Irr.
26.342	68/153	N 3646	E 06654	350	T. turgidum	Black-awned Mauri	W	Irr.
26.343	68/154	N 3646	E 06654	350	T. turgidum	White Mauri	W	Irr.
26.344	68/155	N 3646	E 06654	350	T. aestivum	Sircha	W	Irr.
26.345	68/156	N 3646	E 06654	350	T. aestivum	Saficha	W	Irr.
26.346	68/157	N 3700	E 06646	300	T. aestivum	Saficha	S	Irr.
26.347	68/158	N 3700	E 06646	300	T. turgidum	White Mauri	W	Irr.
26.348	68/159	N 3700	E 06646	300	T. aestivum	Sircha	W	Irr.
26.349	68/160	N 3643	E 06659	375	T. aestivum) T. turgidum)	(Mauri (Saficha (Sircha	W	Irr.
26.351	68/162	N 3637	E 06747	500	T. aestivum	Saficha	W	Irr.
26.353	68/164	N 3618	E 06804	1050	T. aestivum		W	Irr.
26.354	68/165	N 3613	E 06805	1000	T. aestivum) T. turgidum)	(Sircha (Sirhosha (Mauri	W	Irr.

FAO Number	Collection Number	Latitude	Longitude	Altitude (meters)	Species	Variety or local name	Winter or Spring	Irrigated or Non-irrigated
26.355	68/166	N 3607	E 06812	1080			W	
26.359	68/171	N 3611	E 06844	500		Mauri Jalalabadi	W	Irr.
26.361	68/173	N 3607	E 06840	530	T. aestivum) T. turgidum)	(Mauri (Shash Hosha (Jalalabadi (Sirha (Khalhosha	W	Irr.
26.362	68/174	N 3607	E 06840	530	T. aestivum T. turgidum T. compactum	Mauri	W	Irr.
26.364	68/176	N 3548	E 06847	650		Shasti Marjani	W	Irr.
26.366	68/178	N 3535	E 06850	900	T. aestivum	Jalalabadi	W	Irr.
26.367	68/179	N 3528	E 06858	1550	T. aestivum	Sirchah Safidak	W	Irr.
26368	68/180	N 3526	E 06859	1900	T. aestivum) T. compactum)	(Sirhosha (Safid Hoshah (Kalak	W	Irr.
26.370	68/182	N 3615	E 06846	750	T. aestivum) T. compactum) T. turgidum)	(Mauri (Kandahari (Saficha (Malamerzai)	W	Irr.
26.371	68/183	N 3617	E 06848	750	T. aestivum) T. compactum) T. turgidum)		W	Irr.
26.372	68/184	N 3622	E 06853	700	T. aestivum T. turgidum	Mauri	W	Irr.
26.375	68/187	N 3630	E 06854	650	T. aestivum T. turgidum	Black-awned Mauri	W	Irr.

FAO Number	Collection Number	Latitude	Longitude	Altitude (meters)	Species	Variety or local name	Winter or Spring	Irrigated or Non-irrigated
26.376	68/188	N 3634	E 06854	650	T. aestivum T. turgidum	Mauri	W	Irr.
26.377	68/189	N 3636	E 06852	600	T. aestivum	MerzaI	W	Irr.
26.378	68/191	N 3646	E 06852	375	T. aestivum	Safidak	W	Irr.
26.379	68/192	N 3646	E 06852	375	T. aestivum) T. turgidum)	(Mauri (Saficha	W	Irr.
26.380	68/193	N 3646	E 06852	375	T. aestivum	Safidak	W	Irr.
26.390	68/205	N 3645	E 06853	600	T. aestivum) T. turgidum) T. compactum)	(Mauri (Saficha (Sirhoshah	W	Irr.
26.391	68/206.	N 3642	E 06858	650	T. aestivum	Saficha	W	Irr.
26.392	68/207	N 3464	E 06912	450	T. aestivum	Sircha	W	Non
26.393	68/208	N 3643	E.06935	600	T. aestivum		W	Irr.
26.394	68/209	N 3642	E 06938	600	T. aestivum		W	Irr.
26.396	68/211	N 3642	E 06942	800	T. aestivum		W	Irr.
26.397	68/212	N 3642	E 06944	900	T. aestivum) T. compactum)	(Kizilkarak (Kalaizok (Saficha	W	Irr.
26.398	68/213	N 3642	E 06944	800			W	Irr.
26.400	68/219	N 3648	E 06956	1100	T. aestivum	Sirha	W	Irr.
26.401	68/220	N 3705	E 07036	1200	T. aestivum	Safidak	W	Irr.
26.402	68/221	N 3700	E 07045	1200	T. aestivum		W	Irr.
26.406	68/225	N 3701	E 07046	1200	T. aestivum	Lashuk	W	Irr.
26.407	68/226	N 3700	E 07046	1280	T. aestivum	Safidak TirmaI	W	Irr.

FAO Number	Collection Number	Latitude	Longitude	Altitude (meters)	Species	Variety or local name	Winter or Spring	Irrigated or Non-irrigated
26.409	68/228	N 3658	E 07046	1200	T. aestivum		W	Irr.
26.412	68/231	N 3657	E 07047	1200	T. aestivum		W	Irr.
26.413	68/232	N 3653	E 07050	1450	T. aestivum	Sircha	W	Irr.
26.414	68/233	N 3652	E 07050	1500	T. aestivum	Safidak	W	Irr.
26.415	68/234	N 3651	E 07050	1500	T. aestivum		W	Non
26.416	68/235	N 3650	E 07050	1500	T. aestivum	Tirmaī safidak Tirmaī sircha	W	Irr.
26.417	68/236	N 3649	E 07050	1500	T. aestivum	Tirmaī sircha	W	Irr.
26.420	68/239	N 3708	E 07032	1250		Tirmaī Safid Siyaburut Red Sirhosha White Sirhosha Kalgandum	W	Non
26.421	68/240	N 3709	E 07031	1200	T. aestivum T. compactum		W	Non
26.423	68/242	N 3709	E 07030	1200	T. aestivum		W	
26.425	68/244	N 3705	E 07035	1200	T. aestivum		W	Non
26.426	68/245	N 3705	E 07030	1000	T. aestivum		W	Non
26.427	68/246	N 3705	E 07030	1000	T. aestivum		W	Non
26.430	68/249	N 3708	E 07032	1200	T. aestivum T. compactum		W	Irr.
26.431	68/250	N 3709	E 07031	1200	T. aestivum		W	Irr.
26.432	68/251	N 3710	E 07027	1200	T. aestivum	Sirha Beburut	W	Non
26.433	68/252	N 3706	E 07033	1200	T. aestivum		W	Non

FAO Number	Collection Number	Latitude	Longitude	Altitude (meters)	Species	Variety or local name	Winter or Spring	Irrigated or Non-irrigated
26.434	68/253	N 3706	E 07030	1200	T. aestivum		W	Non
26.435	68/254	N 3708	E 07028	1200	T. aestivum	Byaburut Siyaburut Sirha	W	Non
26.437	68/258	N 3704	E 07015	1000	T. aestivum	Sirha Beburut	W	Non
26.438	68/259	N 3700	E 07010	1000	T. aestivum	Sirha	W	Non
26.439	68/260	N 3653	E 06954	900	T. aestivum		W	Non
26.440	68/261	N 3647	E 06952	1000	T. aestivum		W	Non
26.441	68/262	N 3647	E 06948	1400	T. aestivum	Sircha	W	Non
26.442	68/263	N 3643	E 06925	700	T. aestivum) T. turgidum)	(Safidak (Amerikani	W	Irr.
26.443	68/264	N 3520	E 06910	2750	T. aestivum		S	Irr.
26.445	68/266	N 3517	E 06910	2600	T. aestivum		S	Irr.
26.446	68/267	N 3516	E 06910	2600	T. aestivum		S	Irr.
26.447	68/268	N 3515	E 06910	2500	T. aestivum		S	Irr.
26.448	68/269	N 3515	E 06910	2400	T. aestivum		S	Irr.
26.450	68/271	N 3515	E 06910	2350	T. aestivum	Tirmal	W	Irr.
26.451	68/272	N 3536	E 06855	1200	T. aestivum T. turgidum	Mauri	W	Irr.
26.452	68/273	N 3536	E 06856	1200	T. aestivum	Jalalabadi	W	Irr.
26.455	68/276	N 3536	E 06859	1200	T. aestivum	Jalalabadi	W	Irr.
26.456	68/277	N 3536	E 06900	1200	T. aestivum	Jalalabadi	W	Irr.

FAO Number	Collection Number	Latitude	Longitude	Altitude (meters)	Species	Variety or local name	Winter or Spring	Irrigated or Non-irrigated
26.456	68/277	N 3536	E 06900	1200	T. aestivum	Jalalabadi	W	Irr.
26.457	68/279	N 3537	E 06908	1200	T. aestivum) T. compactum)	(Sardah (Safidak (Mauri (Sirha	W	Irr.
26.460	68/282	N 3536	E 06909	1300	T. aestivum	Sardah	W	Non
26.461	68/283	N 3536	E 06912	1500	T. aestivum	Amerikani	W	Irr.
26.462	68/284	N 3537	E 06915	1600		Mauri	W	
26.463	68/285	N 3422	E 06904	2400	T. aestivum	Sirhadi	W	Irr.
26.471	68/293	N 3427	E 06911	2200	T. aestivum	Kalak Darash Hosha	W	Irr.
26.472	68/294	N 3423	E 06911	2200	T. aestivum T. compactum	Gandum	W	Irr.
26.473	68/295	N 3422	E 06910	2000		Gandum	W	Irr.
26.474	68/296	N 3412	E 06910	2200	T. aestivum) T. compactum)	(Safed (Saficha	W	Irr.
26.475	68/297	N 3408	E 06905	2400		Sirhosha	W	Irr.
26.476	68/298	N 3400	E 06900	2400		Wulwakhi (Kalak)	W	Irr.
26.477	68/299	N 3440	E 06904	2200			W	Irr.
26.478	68/300	N 3442	E 06905	2200	T. aestivum) T. compactum)	(Mulyak (Kalak	W	Irr.
26.479	68/301	N 3449	E 06904	1800			W	
26.480	68/302	N 3428	E 06837	2650			W	Irr.
26.481	68/303	N 3428	E 06834	2700	T. aestivum) T. compactum)	(Mauri (Sardah	W	Irr.
26.482	68/304	N 3428	E 06834	2700	T. aestivum) T. compactum)	(Mauri (Sirhosha	W	Irr.

FAO Number	Collection Number	Latitude	Longitude	Altitude (meters)	Species	Variety or local name	Winter or Spring	Irrigated or Non-irrigated
26.483	68/305	N 3427	E 06832	2800	T. aestivum T. compactum	Garma	W	Irr.
26.484	68/306	N 3427	E 06830	2700	T. aestivum) T. compactum)	(Mauri (Sirhosha (Garma (Sardah	W	Irr.
26.485	68/307	N 3427	E 06829	2800	T. aestivum	Garma	W	Irr.
26.486	68/308	N 3427	E 06825	3100		Tirmal Garma	W	Irr.
26.487	68/309	N 3427	E 06824	3250	T. aestivum T. compactum		W	Irr.
26.488	68/310	N 3428	E 06816	3400	T. aestivum	Lalmi	W	Non
26.489	68/311	N 3432	E 06818	3250	T. aestivum		W	Irr.
26.490	68/312	N 3439	E 06802	3300	T. aestivum	Bahri Sirhosha	S	Irr.
26.491	68/313	N 3442	E 06800	2900	T. aestivum T. compactum		S	Irr.
26.492	68/314	N 3442	E 06800	2900	T. aestivum T. compactum		S	Irr.
26.493	68/315	N 3448	E 06748	2900	T. aestivum	Bahri	S	Irr.
26.494	68/316	N 3448	E 06748	2850	T. aestivum T. compactum	Larma Roho	S	Irr.
26.495	68/317	N 3448	E 06748	2850	T. aestivum T. compactum		W	Irr.
26.496	68/318	N 3448	E 06748	2850	T. aestivum T. compactum	Kalabugundak	W	Irr.
26.497	68/319	N 3448	E 06749	2850	T. aestivum) T. compactum)	(Kalabugundak (Bahri	S	Irr.
26.498	68/320	N 3448	E 06749	2850	T. aestivum T. compactum	Larma Roho	W	Irr.

FAO Number	Collection Number	Latitude	Longitude	Altitude (meters)	Species	Variety or local name	Winter or Spring	Irrigated or Non-irrigated
26.499	68/321	N 3450	E 06750	2850	T. aestivum) T. compactum)	(Kalabugundak (Tirmaī	W	Irr.
26.501	68/323	N 3448	E 06751	2850	T. aestivum T. compactum	Darash Hosha (Tirmaī)	W	Irr.
26.503	68/325	N 3448	E 06754	2850	T. aestivum) T. compactum)	(Kalabugundak (Darash Hosha	W	Irr.
26.504	68/326	N 3448	E 06756	2850	T. aestivum) T. compactum)	(Tirmaī (Bahri (Kalabugundak (Darash Hosha	(W (S	Irr.
26.505	68/327	N 3448	E 06757	2850	T. aestivum T. compactum	Kalabugundak	W	Irr.
26.506	68/328	N 3451	E 06746	2850	T. aestivum T. compactum	Kalabugundak (Bahri)	S	Irr.
26.508	68/330	N 3450	E 06738	3200				Irr.
26.509	68/332	N 3448	E 06709	3300	T. aestivum		S	Non
26.510	68/333	N 3446	E 06708	3400	T. aestivum		S	Non
26.511	68/334	N 3445	E 06706	3000	T. aestivum	Safidak Sirha		Irr.
26.512	68/335	N 3443	E 06657	2950	T. aestivum			Irr.
26.514	68/337	N 3436	E 06657	3300	T. aestivum	Bahri	S	Irr.
26.515	68/338	N 3427	E 06700	3200	T. aestivum		S	Irr.
26.516	68/339	N 3425	E 06702	3200	T. aestivum		S	Irr.
26.517	68/340	N 3422	E 06653	3350	T. aestivum	Bahri Lalmi	S	Non
26.518	68/341	N 3423	E 06638	3250	T. aestivum		S	Irr.
26.519	68/342	N 3424	E 06630	3200	T. aestivum		S	Irr.

FAO Number	Collection Number	Latitude	Longitude	Altitude (meters)	Species	Variety or local name	Winter or Spring	Irrigated or Non-irrigated
26.520	68/343	N 3431	E 06619	3250	T. aestivum		S	Non
26.521	68/344	N 3430	E 06617	3150	T. aestivum T. compactum		S	Non
26.522	68/345	N 3428	E 06613	3100	T. aestivum		S	Non
26.523	68/346	N 3428	E 06607	3150	T. aestivum		S	Non
26.524	68/347	N 3428	E 06600	3250	T. aestivum		S	Non
26.525	68/348	N 3427	E 06557	3150	T. aestivum T. compactum		S	Non
26.526	68/349	N 3433	E 06548	2800	T. aestivum T. compactum		S	Irr.
26.527	68/350	N 3433	E 06542	2750	T. aestivum T. compactum		S	Irr.
26.528	68/351	N 3432	E 06527	2650	T. aestivum T. compactum		S	Irr.
26.529	68/352	N 3418	E 06455	3250	T. aestivum T. compactum		S	Non
26.530	68/353	N 3417	E 06453	3050	T. aestivum		S	Irr.
26.532	68/355	N 3415	E 06452	3050	T. aestivum		S	Irr.
26.533	68/356	N 3407	E 06438	2850	T. aestivum	Kalak Baghosi Sirhosha	S	Non
26.534	68/357	N 3407	E 06427	2700	T. aestivum	Bahri	S	Irr.
26.535	68/358	N 3405	E 06424	2650		Safidak Sirha Kalak	S	Irr.
26.536	68/359	N 3411	E 06411	2800	T. aestivum		S	Non
26.537	68/360	N 3415	E 06408	2700	T. aestivum	Bahri	S	Irr.
26.538	68/361	N 3420	E 06357	2050		Tirmal Saficha	W	Irr.

THE FAO SEED LABORATORY

The Seed Laboratory, the oldest working group in the Crop Ecology and Genetic Resources Unit, began its work in 1952. It has since distributed more than a quarter of a million seed samples to every part of the world. We thought that our readers, who have corresponded with it for so long, might like to SEE it, for a change. And so, here

it is. And along with it, we include the pictures of two veterans of the staff, upon whom the laboratory, and the Crop Ecology and Genetic Resources Unit, depend for a service that - we hope - may long continue to serve the needs of agricultural development everywhere.

Carlo Bocchio came to FAO with the opening of the Seed Room, after working for a number of years in northern and southern Africa. He can vividly recall the early days, and the makeshift shelves, tables and ancient salvaged balance with which the seed laboratory began its work. The laboratory was responsible for the maintenance and evaluation of the wheat nurseries of the Near East Wheat and Barley Improvement Programme, and this work was his responsibility. Later, in 1955 and 1956, when the CSIRO-FAO collection of Mediterranean grass ecotypes was being evaluated at the Istituto di Genetica e Cerealicoltura near Rome, he took part in this work at every stage. When vegetative material from this collection was sent to Aberystwyth, he packed the plants for despatch. The experience he has acquired in 18 years have made him an invaluable member of the Crop Ecology and Genetic Resources Unit's staff.

Anna Bastianelli, formerly a member of the staff of the Istituto di Genetica e Cerealicoltura, came to FAO first as a member still of the institute, responsible for the Near East nurseries and the CSIRO-FAO grass collection along with Carlo Bocchio. Since she came to FAO, Anna has maintained all the records of seed distribution and exchange carried out through the FAO Seed Laboratory. More than any other person in FAO she can recall from her records - and, it is rumoured, from her memory - every seed exchange that has ever taken place. The past success of the work of the Seed Laboratory has been due almost entirely to Anna's untiring efficiency and that of her other veteran colleague, Carlo Bocchio. We wish both of them, and their other colleagues on the seed room staff, Aldo Serafini and Eugenio Sgaravatti, the officer in charge of the Laboratory, long and continued success in their vital contribution to a developing world.

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WORLD SURVEY OF GENETIC RESOURCES OF SORGHUM

A PRELIMINARY REPORT

by

J.R. HARLAN

Professor of Agronomy, University of Illinois, Urbana.
Chairman, Sorghum Germplasm Committee

Only a fraction of the species of Sorghum have been collected and used by man. Entire gene-pools in the genus remain unexplored and unexploited. These are the conclusions to be drawn from a survey of world Sorghum collections being conducted by the Crop Evolution Laboratory of the University of Illinois at the request of the Rockefeller Foundation.

The survey has already revealed widespread interest and concern for the safety of Sorghum resources. Existing collections are considered inadequate. In the field, there is a real danger of significant losses of germplasm in the near future. Wisely, the Sorghum Germplasm Committee which has assumed responsibility for the survey has stressed that the absence of an immediate emergency does not mean that immediate collections should not be made. Rather, such a situation offers the possibility of obtaining a good range of variation while it still exists. The timely action initiated by the Sorghum survey may well forestall the critical genetic erosion that is so much to be seen in other genera of cultivated plants.

Sorghum collections conspicuously lack, *inter alia*, wild and weedy forms of the genus. These, since they have a longer evolutionary history than the cultivated species, may be expected to offer sources of insect and disease resistance. In spite of the absence of genetic barriers between cultivated and non-cultivated forms, wild Sorghums have been as yet little used in plant breeding. In addition to such closely related wild species as *S. arundinaceum*, *S. verticilliflorum*, *S. aethiopicum*, *S. lanceolatum*, *S. voegelianum*, *S. propinquum* and others, there are a number of species in other sections of the genus. At least ten are found in Australia, and there are others within the range from Australia to Africa which are not represented at all in the World Collection. It is not yet known whether they have useful characters or even whether all can be hybridised with cultivated sorghum, but some are now threatened by grazing and agricultural disturbance.

The World Sorghum Collection, maintained in India, contains many duplicated entries, similar samples having been introduced to the collection from more than one source. On the other hand, some of the best and most systematic collections of Sorghum have not yet been entered in the World Collection. Some collections have been completely lost. Many stations, lacking the equipment or staff needed to maintain large collections, have discarded large amounts of material so that only fragments remain available for preservation or exchange.

The maintenance of collections presents certain problems. Opinions favour a two-collection system of maintenance, with a working collection and a basic collection. The latter (corresponding to the term "nucleus collection") is seen as containing everything, and should be stored under the best possible controlled conditions, which are yet to be determined by research. Renewal of the basic collection would be done with extreme care, and distribution should be severely limited to the surplus available after renewal, which would be put into the working collections to renew their purity and genetic integrity.

Working collections should be grown at two or more locations in the tropics, but could easily be divided into as many blocks as seems convenient. Material for breeding programmes should be supplied from the working collections.

New collections are urgently needed. The Mali collection of Pasquereau (1965/66) has largely been lost. Other notable West African collections have been made by Dumont (1965) in eastern Niger, Niquez (1959) in Chad and Curtis (1965) in Nigeria, but of these only that of Curtis appears likely to reach the World Collection. In Africa, the highest priority should be given to Ethiopia and the Sudan. Other collections are needed from Tanzania, Kenya, Somalia, Uganda, the Central African Republic, Chad, Nigeria, Niger, Upper Volta, Eastern Congo, Rwanda and Burundi. In Asia, West Pakistan is given high priority, and the foothill areas of Sikkim and Assam are also important. Less urgent, but still poorly collected are Burma, Thailand, Cambodia, Laos and Vietnam. The world collection is also notably poor in Chinese kaoliangs. It has been further suggested that some useful types of the genus might be found along water courses in the southern part of the Mediterranean basin, and in the Arab villages in the eastern Mediterranean area there is some danger that local durras and broomcorns stand in immediate danger of extinction through replacement by modern cultivars.

The Sorghum Germplasm Committee is now coordinating the information which is accumulating as a result of the first stages of its survey. There are still, however, many questions concerning the collection and conservation of genetic resources in sorghum which the committee would like to resolve. It appeals, therefore, to readers of the Newsletter for opinions and information. The results of the survey so far have been based on a series of questions. They now ask these same questions from readers:

(1) Where are the most important gaps in Sorghum collections still to be found?
(2) What regions have not yet been adequately explored or collected?
(3) What types or races are not yet adequately represented?
(4) What regions have the highest priority for immediate collection?
(5) What Sorghum resources are most threatened by immediate loss?
(6) How should the collections be maintained? Should there be two collections? Is it safe to bulk samples, or should all lots be kept separately? How about composite crosses - what role can they play? Where should the collections be grown, and under what conditions?
(7) Who should be responsible for the collections? ...for the distribution of seed? ...for the distribution of information about accessions?
(8) How should collection, conservation, and distribution of seed and information be organised? By whom?

The committee solicits and welcomes readers' comments and suggestions, and values your experience and judgment. Even on such apparently simple matters as maintaining plant and seed collections, much remains to be known. Losses from every kind of collection are still so heavy that knowledge and advice from every quarter are both necessary and welcome.

Readers are urged to feel free to contact any member of the committee directly, whose names and addresses are printed below; they will appreciate every contribution to this collaborative effort.

SORGHUM GERMPLASM COMMITTEE

Mr Hugh Doggett, Serere, Uganda
Dr J.R. Harlan, University of Illinois, Urbana, USA (Chairman)
Dr Lee House, R.F., New Delhi, India
M. J. le Conte, IRAT, Paris, France
Dr R.C. Pickett, Purdue University, Lafayette, USA
Dr G.F. Sprague, USDA, Beltsville, USA
Dr Orrin Webster, USAID, Samaru, Nigeria
Dr J.M.J. de Wet, University of Illinois, Urbana, USA (Alternate)

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A NOTE ON THE SORGHUM AND PENNISETUM WORLD COLLECTION

a short report by

B. R. Murty
Division of Genetics, Indian Agricultural Research Institute,
New Delhi

As has been repeatedly stressed in recent years, the replacement of old and primitive cultivars by modern varieties which is now taking place in almost every part of the world, poses a serious threat to the survival of a wide range of genotypes in every crop which possess many adaptively acquired gene complexes of immediate or potential value for crop improvement.

Among the cereals, *Sorghum* and *Pennisetum* are grown under a wide variety of ecological conditions. The world collection of more than 12,000 entries of this important group of cereals from 44 countries, assembled with the aid of the Rockefeller Foundation and the cooperation of plant breeders in many countries, is in the care of the Indian Agricultural Research Institute.

The collection has been evaluated on the basis of an analysis of 46 characters in 16 different environments ranging from 8°N to 32°N over a five year period from 1963 to 1968.

The material has been classified according to a number of genetic criteria and, using multivariate and canonical analysis and similar techniques, genetic divergence between the populations represented by the collection has been estimated. Genetic variance between and within samples has been determined. Key identifying features of different groups have been described and illustrated.

Genetic analyses involving 12 vegetative characters, 18 panicle characters, and reaction to 16 diseases and pests have given much valuable information on genotype-environment interactions, heterosis, protein content, amino-acid balance and resistance to pests, diseases and drought. Lines high in protein, lysine, and methionine have been identified and isolated, and these open new possibilities for the improvement of the crop. Two new *Sorghum* and four new *Pennisetum* hybrids adapted to a wide range of environments in India and other areas in Asia and Africa, have been released.

Data have been presented in a form amenable to computer storage and retrieval, and a programme has been developed for the analysis as well as the ordered retrieval of information.*

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* These studies have been published in a special volume of the Indian Journal of Genetics and Plant Breeding. Copies may be obtained from the Editor of the journal, at the Indian Agricultural Research Institute, New Delhi, 12.

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PRELIMINARY SURVEY OF PLANT GENETIC RESOURCES

IN SEED AND PLANT COLLECTIONS

The Crop Ecology and Genetic Resources Unit has begun a phased emergency survey of collections of cultivated plants and related species. It is based on a questionnaire of extremely simple form, which it is hoped will encourage rather than discourage cooperation. Figure 1 illustrates the English version of this form. To the 483 questionnaires so far distributed, there have been 281 replies, representing a 58.2 percent response while replies are still coming in.

The first phase, the collection of the basic data provided by the questionnaire - the location of collections, their size, their custodians, how they are stored, and further addresses to contact - is divided into stages. At each stage possible locations of further collections are generated, which, in their turn, are contacted. The enquiry thus becomes more precise as the data of each stage are added to it, until a point is reached at which all or the majority of suggested new locations have already been contacted previously. At this point saturation is assumed, probably corresponding to something like 85 to 95 percent efficiency.

At present, at the end of the first stage, more than 900,000 samples have been located. In later issues of the Newsletter details of collections will be published as data accumulate. At this point a few preliminary observations only need be made. In the first place, there is clearly a large degree of duplication in world collections. The extent of this may never completely be determined. But though excessive duplcation may have disadvantages, there are also advantages, in that samples duplication is the best kind of insurance against sample loss. It should indeed be encouraged, especially in smaller collections, where the chances of loss through inadequate maintenance facilities, staff changes and changes in breeding programmes, are substantially greater than is the case with larger collections. Nevertheless, it should be clear that when samples are duplicated, correct identification and the maintenance of accurate records - particularly of their origin - is a responsibility the neglect of which may impose unnecessarily heavy burdens during evaluation and utilization procedures.

The number of samples revealed by the survey is larger than expected, but the survey also reveals that only a small proportion of maintenance centres possess (or use) special storage facilities (28.5 percent), and that 350,000 samples are stored under special conditions. At this phase of the survey distinctions are not drawn between different types of special conditions, but later phases are planned to reveal details of storage such as controlled temperatures (above and below zero), controlled humidity, controlled pressure and controlled atmosphere. It is clear, however, that the majority of samples are exposed to varying degrees of selection due to the conditions in which they are maintained, and that under such conditions it is doubtful whether we can truly speak of samples duplication for more than a few generations. It is possible to conceive that in many of these samples evolution of some sort is still taking place. Undoubtedly one of the later phases of our survey, during which it is planned to record genetic and other evaluation data relating to collections, will be able to reveal whether this supposition is true.

In the near future the survey data will be recorded on magnetic tapes and discs for computer handling and analysis. This will permit much wider and more valuable use of collections. Within the same period regional gene banks (such as those now in the advanced planning stages in northern, central and southern Europe, and in southern and central Asia) will assume greater responsibility for the maintenance of important collections. A full and detailed knowledge of the world's plant collections is an essential pre-condition to their full utilization. It is at the same time the basis upon which future exploration may be most efficiently planned. For these reasons we hope that each stage of the survey will receive the fullest support of plant breeders.

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Crop Ecology and Genetic Resources Branch
Plant Production and Protection Division

PRELIMINARY SURVEY OF PLANT GENETIC RESOURCES

As you will learn from the letter accompanying this form, FAO is conducting an emergency survey of the world's resources of cultivated plant species and closely related wild species which are held at present in plant and seed collections in institutions of various kinds in every country. It is urgently necessary to assess the extent of available resources, so that the collection of plant materials essential for plant breeding programmes may be organized before reserves in the world's centres of genetic diversity are lost.

We therefore ask you to answer the few simple questions on the reverse side of this form, and return it to us in the addressed envelope which is provided.

The questions are brief, and do not further involve you or your colleagues unless you or they wish, at a further date, to cooperate with this Branch's Genetic Resources Information Centre We would appreciate, therefore, an early return of the completed form, so that our survey may be completed as rapidly as possible. The results of the survey will be made available to all who have contributed to it.

We would like to receive your reply by

We thank you for your cooperation.

NOTE: THIS SURVEY SUPERSEDES THAT CONDUCTED IN THE PLANT INTRODUCTION NEWSLETTER IN RECENT YEARS, THE RESULTS OF WHICH WERE PUBLISHED DURING 1966 AND 1967. WHETHER OR NOT YOU CONTRIBUTED TO THE EARLIER SURVEY, PLEASE RETURN A COMPLETED FORM.

1. NAME AND ADDRESS OF INSTITUTE (complete this only if that used by us is incorrect)

____

____

2. NAME THOSE AT YOUR INSTITUTE WHO MAINTAIN PLANT OR SEED COLLECTIONS, THE SPECIES MAINTAINED BY EACH, STATE THE APPROXIMATE SIZE OF EACH COLLECTION, WHETHER IT IS MAINTAINED AS PLANTS OR AS SEED, AND WHETHER OR NOT SPECIAL STORAGE CONDITIONS ARE USED. NO OTHER DETAILS ARE REQUESTED.

NAME	COLLECTION			
	SPECIES	APPROX. NO. OF SAMPLES	SEED OR PLANT	SPECIAL STORAGE YES/NO

3. NAME UP TO FIVE COLLEAGUES IN OTHER INSTITUTIONS OR IN OTHER PARTS OF THE WORLD WHO MAINTAIN PLANT OR SEED COLLECTIONS, WRITE THEIR ADDRESSES, AND (IF YOU KNOW) NAME THE SPECIES MAINTAINED BY THEM.

NOTE: We will send a similar form to each of those whom you name. Do not worry about possible duplication. These are eliminated by us before forms are dispatched.

	NAME	ADDRESS	SPECIES in collection
A)			
B)			
C)			
D)			
E)			

Figure 1

FORTHCOMING EXPEDITIONS. QUERIES. CORRESPONDENCE.

Medicago spp.

WANTED

Dr. J.B. Doolette, Pasture Research Officer, and Dr. I.B. Kaehne, Plant Breeder, of the Department of Agriculture, South Australia, are anxious to establish contact with individuals or institutes working with perennial *Medicago* species, or who propose to make field collections of these species in the near future. They point out the difficulty in terms of cost and time for those working far from the centres of collection of species they work with. At present they are making a collection of perennial *Medicagos* and are building storage facilities, and ask if material might be collected on their behalf in any forthcoming expeditions, in exchange for seed from their present collections. Will willing cooperators please contact them directly at Box 901E, Adelaide South Australia 5001.

Cicer spp.

WANTED

Dr Satish Chandra, Economic Botanist, Department of Plant Breeding, Punjab Agricultural University, Hissar, India writes:

"..we are interested in obtaining for our work some of the wild species of *Cicer* to which genus the cultivated gram *Cicer arietinum* L. belongs. We believe that you may be of help in getting such material for us, from your own stocks or from cooperating agencies. We are keen to get as many of the known *Cicer* species as possible." Can any readers help?

GREENHOUSES FOR THE TROPICS

Dr. W.K. Agbe, Associate Director, Crops Research Institute of the Ghana Academy of Sciences, P.O. Box 3785, Kumasi, has described some of the difficulties encountered in producing greenhouses for the tropics. A great deal of research has been, and is being done on this widely encountered problem, but we feel that it might be useful to bring together as much of the experience, published and unpublished, together in the columns of the Newsletter. Will readers with knowledge of this problem, or who know of published or unpublished work on it, please write to the Editor, at the Crop Ecology and Genetic Resources Unit, FAO, Rome 00100. Please mark your letters "tropical greenhouses."

FORTHCOMING EXPEDITIONS

Dr. L. Edge, Division of Tropical Pastures, Townsville, Queensland, Australia: early 1970 to Puerto Rico, Brazil, Paraguay and Jamaica *** Mr. I.B. Staples, Research Plant Breeder, Parada Research Station, Queensland Department of Primary Industries: for five months from March to July 1970, to Malagasy, Malawi, Zambia, South Africa, Rhodesia and Tanganyika *** Two FAO - Canada joint teams to Turkey and Iran: May and June 1970, for cereals and *Avena* spp.

09789

GENETIC EROSION IN THE INDIGENOUS CULTIVARS OF BORNEO

by

G.N. Appell

Department of Anthropology, Brandeis University.
Editor, Borneo Research Bulletin

With the discovery of the New World a number of important cultivars was introduced into the agriculture of the peoples of Borneo. Probably the most important of these were maize, cassava, and tobacco. The effect of the new cultivars on the population dynamics of the island is not now known, but they were rather quickly incorporated into the local agricultural systems and are now grown practically everywhere in Borneo along with the dominant crop of the region, rice. Consequently, in this paper, I regard the New World introductions as indigenous, along with those cultivars which are historically more deeply-rooted, and distinguish both from the improved, advanced cultivars that are now being introduced into the country.

The pace of plant introduction and replacement in Borneo has rapidly increased since the second World War, and my purpose here is to outline the impact that these improved cultivars have had, and are having, on indigenous genetic resources.

The most significant erosion of the indigenous genetic resources is occurring with swidden-grown rice. There is a myriad number of ecotypes of rice. Each valley has its own local varieties that are particularly well adapted to the local conditions. These local varieties are rapidly disappearing as swidden cultivation is being replaced.

In some areas wet rice agriculture based on improved varieties is being introduced over wide areas with government support. Whole populations of river regions as extensive as the Kinabatangan River basin, for example, are being relocated in areas suitable for irrigation. In other areas the monoculture of rubber and coconuts is replacing the original swidden cultivation. And in some cases whole villages are moving from the interior down to the coast to be nearer commercial centres, attracted by wage labour or irrigation agriculture and to participate more advantageously in the national economy.

However, the change from a swidden-based rice economy does not result in loss of the genetic resources of indigenous rice only. In addition it leads to the destruction of the local varieties of a large number of other cultivars that form part of the integrated system of swidden agriculture. These include maize, cassava, taro, Job's tears, sweet potato, and a number of vegetables. Furthermore, as the peoples of Borneo have become more dependent on a cash economy, the local varieties of cotton grown for the weaving of clothing have ceased to be cultivated in many areas.

The interest in developing wet rice agriculture has also had the unfortunate consequence of replacing the indigenous wet rice varieties with improved species before the local varieties have been preserved. Irrigated rice has had a more restricted distribution in Borneo than swidden-cultivated rice, but major centres of wet rice cultivation along the various coastal plains as well as in a few isolated highland valleys existed long before the first European contacts.

The agricultural departments of various Borneo governments, missionary stations, Peace Corps volunteers, and the occasional anthropologist who brings along improved seeds to win the favour of the people he is studying, are the major agents of crop replacement.

In the case of most if not all missionary stations that specialize in improving local agricultural practices, there may be almost no knowledge on the part of the staff of the indigenous system of agriculture and the indigenous cultivars, or any appreciation of them. Instead they concentrate on "modernizing" the agricultural system, without consideration of the appropriateness of such systems to the local environment and the culture of the peoples so engaged.

Agricultural departments also have not fully realized the function and importance of indigenous methods of agriculture and the contributions that they can make both to agricultural knowledge and the genetic resources of crops. Consequently, they devote little of their resources towards this problem.

As a result, there are now no attempts to my knowledge to preserve the rapidly deteriorating, indigenous genetic resources of Borneo. The only major attempt that has been made was that of a botanist from the United Fruit Company, who almost a decade ago toured Borneo to collect varieties of banana for developing new disease-resistant varieties.

There is no doubt that the situation in Borneo is such that there is an immediate need for crop botanists to make surveys of the island and to select local varieties for preservation. And the experience of the botanist from the United Fruit Company would indicate that the most productive way to locate local varieties for preservation is to work closely with anthropologists who are familiar with the area and the local systems of agriculture.

Other steps can also be taken to help alleviate the rapidly deteriorating situation, without waiting for botanists to take action. If agricultural stations were aware of the importance of preserving local varieties, and if they knew where to send collections for preservation, a steady flow of local genetic material to genetic banks may be developed. To accomplish this involves alerting local agricultural experts to the problem and locating interested, accessible institutions to maintain gene banks.

The Borneo Research Bulletin, which is widely distributed among social scientists, biological scientists, and local government personnel, was established just for such purposes, and we hope to alert the readers to the nature of the problem in future issues. We however, do not have a full and complete list of interested institutions that would be willing to serve as genetic banks and we would welcome such information.

Finally, if cooperation with other institutions can be developed, anthropologists may also be most glad to collect local varieties to send to gene banks in the course of other investigations.

But these are all stop-gap methods. We await full and detailed reconnaissance of cultivated plant resources in the area by qualified botanists, hopefully in conjunction with anthropoligists familiar with local social structures and systems of agriculture.

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09790

PLANT EXPLORATION AND INTRODUCTION
(The Pacific Countries)

Part I 1962-1966

by

Kosuke Yamashita[1] and Hiroshi Ito[2]

Introduction

In recent years the importance of plant exploration and introduction has been widely recognised, and the number of research workers and the amount of research in this field has considerably increased. The International Biological Programme (IBP) of the International Council of Scientific Unions (ICSU) has encouraged activities in plant exploration and introduction since 1964, with the strong support of FAO, as part of the activities of its UM (Use and Management) Section.

It is foreseen that many of the activities which are now taking place at local and national levels will more and more become merged in an international and cooperative programme. The present report presents, in two parts, a summarized account of what is known to have been undertaken by the countries of the Pacific region in recent years. It is based on data obtained from universities and research organizations in the Pacific countries.

1. Australia

The Division of Plant Industry, Commonwealth Scientific and Industrial Research Organization, is in charge of plant exploration and plant introduction. Many members of this Division have made journeys to South and Central America, U.S.A., Europe and the Mediterranean countries, and to Asia and the countries bordering the Pacific. Details of their collections are shown in Table 1.

The number of samples introduced and distributed during each year from 1962 to 1966 is shown in Table 2.

More recently the preservation of germplasm, particularly of tropical and sub-tropical species, has increased in importance. Thus, subterranean clover, (*Trifolium subterraneum*) is now attracting much attention, especially in Western Australia. A number of lines of the perennial grass,

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[2]Division of Genetics, National Institute of Agricultural Sciences, Hiratsuka, Kanagawa Pref., Japan

Table 1

Year and region	Collection Grasses	Legumes	Others	Total	Collector
SOUTH & CENTRAL AMERICA					
1963	-	-	-	-*	Gartner, T.A.I.
1963, 1964	10	230	27	267	McKee, H.S.
1963, 1964	6	48	0	54	Hutton, E.M.
1964	0	5	-	198	Norris, D.O.
1965	543	826	79	1,448	Atkinson, W.T.
1965	-	-	-	-	Ebersohn, T.E.
1965	83	360	20	463	Williams, R.J.
1965**	-	-	-	475	Grof, B.
Total	643	1,669	131	2,431	
UNITED STATES OF AMERICA					
1962-1966	1	2	4	7	-
1966***	-	-	-	28	Rogers, V.
Total	1	2	-	35	
EUROPE & MEDITERRANEAN					
1964	0	0	214	214	May, P.
1965	17	23	16	56	Leigh, J.H.
-	10	5	3	18	-
Total	27	28	233	288	
AFRICA					
1963	138	79	0	217	Jones, R.
1965	15	6	0	21	Milford, R.
1965	-	9	-	20	Britten, R.
1965	76	10	4	90	Simpson, H.
1965	1	35	52	88	Leigh, J.H.
1965	11	13	0	24	Skerman, P.
1963-1965	0	4	4	8	-
Total	241	156	-	477	
ASIA & PACIFIC					
1963	0	4	15	19	McKee, H.S.
1963	-	-	-	-	Phillis, L.
1963	47	-	0	92	Carr-Clark, B.
1965	1,679	64	134	1,877	Halloran, G.
Total	1,739	126	149	2,015	
GRAND TOTAL	2,652	1,969	577	5,198	

* = No data ** = Also Asia and Africa *** = Also USSR

Table 2

Period	No. of samples Introduced	Distributed
July 1961 - June 1962	2,383	2,014
July 1962 - June 1963	1,365	7,470
July 1963 - June 1964	2,033	8,395
July 1964 - December 1965	5,486	6,107
July 1965 - June 1966	3,167	4,192

Phalaris tuberosa, is maintained at Canberra, but many collections of this species from the Mediterranean region have been lost because of the difficulties of maintaining it from generation to generation without incurring significant genetic changes. The need for adequate facilities for long-term seed storage under low temperature, therefore, is keenly felt.

2. Canada

The Taxonomy Unit, Research Branch, Department of Agriculture, is in charge of plant exploration and introduction. Details of the most important exploration missions in the period under consideration are given below in Table 3.

Table 3

Year	Region	Collector	Taxon collected
1962	Pacific Northwest	Gillet, J.M.	Trifolium
1963	U.S. Rockies	"	"
1964	Western United States	"	"
	Mediterranean	Zilinsky, F.J. and Rajhathy, T.	Avena
	Turkey	Lesins, K.	Medicago
	U.S., Southern Great Plains and Florida	Mosquin, T.	Linum
1965	California and Arizona	Grant, W.W.	Lotus
	Northern Europe	Downey, R.K.	Brassica

A yearly Index Seminum is published, and provides the main basis for seed exchange. Germplasm preservation has been the subject of discussions, during the period 1962-1966, under the auspices of IBP.

3. Chile

The Department of Plant Breeding, College of Agriculture, University of Chile, Santiago, is responsible for plant exploration and introduction. As yet, overseas exploration missions have not been organized by personnel

of this centre. However, several domestic collection trips have been made during the period 1958-1962, and *Atriplex* species, forage crops, and native races of corn have been collected, as listed below in Table 4.

Table 4

Year	Area	Leader	No. of members	Taxa collected
1962 (spring)	Norte Grande and Norte Chico	Edmundo Posano	3	*Atriplex* spp.
1962 (summer)	Norte Grande and Norte Chico	Murphy, R.	2	Forage species
1958-1960	-	-	-	Native maize races

4. Fiji

The Natural Resources Branch, Department of Agriculture, takes charge of plant exploration and introduction. So far, no overseas exploration trips have been undertaken, but plant materials have been introduced regularly from various countries. Plant introductions numbered 115 in 1962, 102 in 1963, 337 in 1964, and 91 in 1965. Data relating to these are published annually in the "Plant Introduction List".

5. Hong Kong

The Department of Agriculture and Fisheries takes charge of plant exploration and introduction. Explorations have not been undertaken, but plant introduction is rather active. International seed and plant exchange activities are detailed in Table 5 below.

Table 5

	Introduced			Distributed		
Year	No. of crops	No. of varieties	No. of countries	No. of crops	No. of varieties	No. of countries
1962	12	130	17	3	62	15
1963	13	63	6	1	42	1
1964	30	286	14	2	6	1
1965	2	212	2	-	-	-
1966	2	250	2	-	-	-

6. Japan

Since plant exploration, collection and the permanent maintenance of genetic stocks had been previously carried out independently, in April 1966 at its General Assembly, the Science Council of Japan recommended the government to systematise the organization of activities in this field. Expeditions undertaken by Japan in the period up to 1966 are listed in Table 6.

Table 6

Year and area	Leader	No. of Members	Crops collected
1962			
North Europe	K. Kawakami	1	Solanum tuberosum
Thailand and Malaya	T. Kira	8	Rice, maize, soyabean, cereals and vegetables
Nepal	S. Nakao	6	Rhododendron, Meconopsis, trees, grasses, cereals, beans and fruit trees
Burma, Ceylon and India	T. Shimura	4	Thea sp.
Europe	C. Suto	1	Beta sp.
Europe and N. America	K. Goto	1	Soyabean
1963			
Borneo	T.C. Katayama	1	Oryza sp.
Philippines (South)	H.I. Oka	2	"
" (North)	T. Tateoka	2	"
North America	K. Kawakami	1	Solanum tuberosum
India and Europe	K. Murakami	1	Zea mays
1964			
West Africa	H.I. Oka	2	Oryza sp.
Madagascar and East Africa	T. Tateoka	1	"
Nepal	J. Cho	2	"
"	K. Kurita	3	Medicinal Plants
Netherlands	Y. Masuo	1	Flax

Table 6 (continued)

Year and area	Leader	No. of Members	Crops collected
1964 (continued)			
Europe	S. Abe	1	Tulip and other flowers
Pakistan	J. Tomo	1	*Thea* sp.
U.S.A. and Taiwan	S. Ouchiyama	2	Sugar cane
1965			
India, Ethiopia and Mediterranean coast	U. Mizushima	3	Cruciferae
1966			
U.S.S.R.	K. Yamashita	4	Wheats and related genera

In addition, domestic collections of indigenous species and varieties of crop plants have been conducted every year. The annual amount of plant material handled by the Ministry of Agriculture and Forestry of the Japanese Government, given as an average on data over the five year period 1962-1966, is shown in Table 7.

Table 7

Crop	Research organizations sponsored by: National Government		Prefectural Government	
	Introduced	Distributed	Introduced	Distributed
Paddy field rice	60	155	2	15
Upland rice	0	0	0	5
Wheat	119	56	0	10
Barley	2	25	0	0
Soyabean	32	20	35	30
Red bean	0	20	0	1
Beans (miscellaneous)	0	0	6	8
Oil rape	17	7	31	11
Corn	50	50	50	20
Sorghum	35	5	0	0
Sweet potato	47	5	0	0
Irish potato	138	26	0	0
Oats	48	3	0	0
Rye	0	0	0	0
Industrial crops	9	6	0	0
Herbage plants	151	39	0	0
Tea	420	0	0	0
Vegetables	433	51	56	8
Fruit trees	300	156	163	106
Flowering plants	0	0	36	0
Total	1,861	624	379	214

Long-term seed storage is becoming popular for the maintenance of genetic stocks of seed plants. It is otherwise virtually impossible to ensure the safety of seeds raised from annually sown samples. Selection and handling errors lead to serious samples losses.

The research programme, "Maintenance of germplasm" of the UM Section of IBP, which was organized in Japan in 1965, has four main objectives, namely (a) a general survey of resources, using available information and publications, (b) long-term maintenance of viable germplasm, not only as seed but as vegetative stock, tubers, pollen and even tissue-cultures, (c) investigation of the population size suitable for the maintenance of a variety or species, and (d) studies on the adaptability and variability of plants. The Ministry of Agriculture and Forestry has built a seed storage laboratory suitable for extremely long-term preservation at the National Institute of Agricultural Sciences at Hiratsuka, which will serve as a centre for genetic stocks for all economic plants in Japan.

7. Macau

The only data available show that 220 species of 71 families of plants, including 12 species from Goa, are recorded as having been brought to Macau by the Portuguese in ancient times.

8. Thailand

A Plant Introduction Service was established in the Botanical Section of the Plant Industry Division, Ministry of Agriculture, in 1961. Since then, the introduction of more than 900 varieties has been recorded.

9. United States of America

The New Crops Research Branch, Agricultural Research Service of the U.S. Department of Agriculture, the organisation of which is described in Newsletter 22, and which is responsible for exploration and introduction activities, has provided the data on botanical missions for the years 1962 to 1966 listed in Table 8 below.

Table 8

Year and area	Author	Objectives
1962		
Nepal	J.L. Creech and F.De Vos	Ornamentals
Ethiopia	F.G. Meyer	Coffee genetic stocks and plant materials for anti-cancer screening
1963		
U.S.S.R.	J.L. Creech and D.H. Scott	Fruits and ornamentals

Table 8 (continued)

Year and area	Author	Objectives
1963 (continued)		
Mexico	L. Williams	Vanilla genetic stocks
"	A.S. Barclay	Materials for screening for new crops and anti-carcinogens screening.
1964		
Russia, Poland and Czechoslovakia	C.O. Erlanson	Establishment of international exchange
South Africa	A.J. Oakes, Jr.	Warm season grasses and genetic stocks
Ethiopia	R.E. Perdue, Jr.	Plant materials for anti-cancer screening
1965		
Yugoslavia, Bulgaria, Rumania, Hungary and Czechoslovakia	J.C. Craddock	Survey of areas for resistance to cereal leaf beetle
Central America and Mexico	H.S. Gentry	Genetic stocks of beans (Phaseolus)
U.S.S.R.	Q. Jones and W. Keller	Forage and range genetic stocks
1966		
Brazil, Peru, Ecuador, Guatemala and Costa Rica	H.H. Fisher	Establishment of international exchange
Dahomey and West Africa	L. Williams	Survey on agricultural crop development
Ethiopia, Kenya, Rhodesia and South Africa	C.E. Smith, Jr.	Germplasm of new oilseeds
Kenya, Uganda and Tanzania	R.E. Perdue, Jr.	Plant material for anti-cancer screening
Mexico	A.S. Barclay	Potential new crops and plant materials for anti-cancer screening

10. U.S.S.R.

The Vavilov Institute of Plant Industry, Leningrad, is in charge of plant exploration and the introduction of crop plants. Up to 1966 collections total 160,000. A total of 34,127 crops and related wild species were introduced during the period from 1962 to the middle of 1966. Every year, two or three groups are engaged in domestic exploration and collection. These missions are organized by members of the Institute and by research workers from universities and other research organizations. The annual increase in the number of collections is, on the average, from 6,000 to 8,000. Crops introduced from foreign countries are listed in Table 9. A domestic expedition for fodder crops was undertaken in cooperation with the U.S.A. in 1965.

Table 9

Year and area	Collector	Material (and number collected)
1962		
Sweden	I.A. Sizov	Cereals (81), vegetables (6), fodder crops (6), oil seed crop (1), and industrial crops (11)
Finland	A.Y. Trophomovskaya	Cereals and fodder crops (20)
Australia	P.A. Pubenets	Wheat and barley (25), beans (28), vegetables (59), *Eucalyptus* sp. and *Acacia* sp.
1963		
Afghanistan	T.N. Shevchuk	Wheat, barley and maize (39), beans, sesame, melons etc. (725)
1964		
Japan	D.V. Ter-Avanesyan	Rice, wheat, barley, beans, maize etc. (869)
1965		
Yugoslavia	G.S. Cikalo	Cereals and vegetables (204)

11. Other countries

Brief data from Guatemala, Ryukyu, the Territory of Guam, and the Trust Territory of the Pacific Islands have been received, but during the period 1962-1966, no activities in the field of exploration and plant introduction have been undertaken in these countries.

12. FAO

Immediately prior to the period in question, the Plant Production and Protection Division convened a conference on plant exploration and introduction in Rome, in 1961. The proceedings of this Technical Meeting were published in 1963 in the journal "Genetica Agraria", 17, 1-573. Subsequently, a general survey of activities in the field was undertaken, in 1965, and data obtained by this survey have been published from time to time in earlier issues of the Plant Introduction Newsletter. FAO Agricultural Study 40, on Plant Exploration, Collection and Introduction, by R.O. Whyte, published in 1958, is still one of the few reference works in this field, though unfortunately out of print.

(To be continued)

PUBLICATIONS RECEIVED

JUNE TO DECEMBER, 1969

AGROBOTANIKA 9 (1967) Journal of the National Institute of Botany, Tápiószele, Hungary. This volume contains one article of special interest in the field of genetic conservation. It is by J. Mesch, and describes "Methods used in testing the international wheat collection at Tápiószele." The text is in Hungarian, with an extended English summary. Diagram captions are in English.

Bareš; I. and Vlach, M. (1967) "Investigations on the productivity of foreign varieties of winter wheat (*T. aestivum* L. f. Hiemalis under the conditions of Czechoslovakia." In Czech with an English summary. Reports four years of tests on 89 Czech and introduced winter wheat varieties. Ved. Prace Ustred. Vyzk. Ust. Rostlinne Vyroby, Prague, Ruzyne (12), 91 - 102.

Brücher, H. (1968) "Die genetischen Reserven Südamerikas für die Kulturpflanzenzüchtung." In German with English summary. The genetic resources of the South American continent are reviewed. The author considers that these resources are by no means exhausted, though in view of the extermination of genetically useful land-race in certain areas, a practical and realistic programme to save South American gene pools should be carried out without any further loss of time. *in* Biogeography and Ecology in South America (ed. Fittkau, E.J. *et al*.). Junk, den Haag.

CIMMYT News 4 (1969) The May-June issue devotes several pages to a progress report on high-protein maize. A search, based on opaque-2 and floury-2 mutants occurring in Mexican races from the germplasm bank, and in collections from Colombia, Ecuador, Peru and other countries of central America, has revealed some Mexican races having high tryptophan values. By contrast the July-August issue reports briefly on radiation induced mutants. The amber-grained wheat obtained from Sonora 64 in India, for which high protein and lysine values have been reported, has not shown significant differences from parent varieties, when tested in Mexico. In the same issue, tests on 489 maize lines and 150 durum wheat lines from the USDA world collection have revealed a wheat line (II-21263) with an average 19.54 percent protein content.

Davis, P.H. (1961) "Hints for hard-pressed collectors." This is what it says - useful advice on the collection of herbarium material by an eminent taxonomist and field botanist, well-known for his "Flora of Turkey", at present in its third volume. Watsonia 4 283 - 289.

Frankel, O.H. (1968) "International collaboration in plant exploration and conservation." The author analyses some of the problems encountered during the initiation and development of collaborative genetic conservation programmes. J. Austral. Inst. Agr. Sc.34, 22 - 27.

Godron, M. et al (1969) "Code pour le Relevé Méthodique de la Végétation et du Milieu: Principes et Transcriptions sur Cartes Perforées." This joint work by members of the Montpellier ecological group under the direction of L. Emberger describes their techiniques for the standardised recording and computer analysis of ecological data in considerable detail. Based on studies over a ten year period, the book's declared aim is to "enable ecologists to speak the same language and to understand each other", an admirable objective in any science. If standardised and coded procedures can attain this, and experience in IBP in the collection of field data on a wide scale indicates that it can, then this book may provide a model for much-needed developments in other fields.

IBP News 20, (March 1969) "Index of National Projects. Section UM (Use and Management of Biological Resources)." Countries and sites of IBP projects are listed with the names and addresses of the workers in charge of each project, and details of the size, cost and duration of each project are given. Twenty-five projects are concerned directly with plant gene pools.

International Conference on Culture Collections, Tokyo. (1968) Organised by the Japanese National Commission for UNESCO and the Japanese Federation of Culture Collections. The conference considered problems of culture maintenance, many of which are similar to those encountered with germplasm collections. Among papers most relevant are those by:

Lessel, E.F. "Dilemmas of curators of culture collections". Lessel discusses especially the transfer of collections from individual to individual, through wide ranges of environment, and the associated dangers of changes in samples through the action of selection or contamination. As is the case with germplasm samples, many cultures come to circulate with the same number but with different characteristics.

Martin S.M. and Quadling C. "The World Directory of Culture Collections". The use of electronic data processing techniques is described. The authors also refer to defects in the questionnaire approach to compiling such directories.

Simpson F.J. et al. "Storage and Retrieval System employing a Digital Computer for Culture Collections". Details are given of an electronic data processing system employed on Canadian culture collections.

Juliano, B.O. et al. (1968) "Screening for high protein rice varieties." More than 7.500 rice varieties from the International Rice Research Institute's world collection have been screened for protein. The average protein-content for brown rice was found to be 10.6 percent. A total of 44 varieties had a mean protein content of 15 percent or higher. Amino-acids were also determined. All characters showed a normal, uni-modal distribution. Protein content ranged from 5 to 17 percent; lysine and threonine values for 126 varieties with a mean protein content of 14 percent or higher ranged from 17.5 to 24.2 percent of N to 18.3 and 25.1 percent of N respectively. Amylose content for non-waxy, milled rice ranged from 7.4 to 25.5 percent. The collection represents, therefore, a rich source of useful variation for breeding. Cereal Science Today 13.

Kuckuck, H. (1969) "Probleme der Erhaltung der natürlichen Formenmannigfaltigkeit und ihre Nutzung in der Züchtung." The use of land-races and primitive cultivars in plant breeding is discussed in some detail, with reference to examples. The

author stresses the importance of primitive forms as breeding material. The history of plant introduction and plant exploration is reviewed, from the early activities of the USDA and of N.I. Vavilov up to the recent construction of gene banks in Japan, the Near East and Europe, and the role of FAO in coordinating activities on a world scale. Saatgutwirtschaft-SAFA 21.

Pimentel, D. and Stone F.A. (1968) "Evolution and population ecology of parasite-host systems." Experiments on the interaction of host and parasite populations are described, and the authors argue that genetic feed-back operating through this interaction has an ecologically regulating function. Experimental data also strongly suggest that mutual tolerance evolves between host and parasite populations, the former developing what may be described as "adaptive resistance" and the latter becoming less virulent, compared with controls. Similar patterns of evolution may be responsible for the "field resistance" which is frequently encountered in primitive cultivars and contributes to their great value in plant breeding. The exploitation of field resistance presents technical problems, however, and the work of Pimentel and his co-workers suggests a model for similar, much-needed studies with cultivated plants. Canadian Entomologist 100, 655 - 622.

Quinn, J.G. (1969) "Plant Introduction List, 1967". Institute for Agricultural Research, Ahmadu Bello University, Samaru, Nigeria.

Rodriguez, A. et al. (1968) "Maices Bolivianos". This work is an illustrated description of the morphology, disease resistance, and geographical and ecological distribution of approximately 150 native races of Bolivian maize. published by FAO, Rome.

Siegenthaler, I.E. (n.d.) "Useful Plants of Ethiopia". An illustrated study of approximately 100 useful native plants of minor importance, and several crops of major importance locally. The work is being extended to include such crops as sorghum, barley, maize, wheat and beans. Bulletin No. 14, Jima Experiment Station.

Troničkova, E. (1966) "Optimal ways of handling and storing seeds of agricultural plants from the viewpoint of preserving their maximum biological value. (Review)". This paper is in Czech, with English, German and Russian summaries. The reference lists cites 186 papers. Studijni Informace No. 10, Prague.

Zhukovsky, P.M. (1967) "The nature and limits of species in cultivated plants". The author discusses species concepts in connection with problems raised in the taxonomy of cultivated plants. Using the genera Zea, Triticum and Solanum as examples, it is argued that in these and in other cultivated taxa revision is urgently necessary. In Russian with English summary. Bot. Zhurn. 52, 1530 - 1539.

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